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ABSTRACT

A study tested the relative effectiveness of four methods of teaching remedial reading students (grades 6 through 11) how to identify the main idea of expository paragraphs. Forty-seven students were divided according to treatment and were given the same pool of 125 paragraphs about geology and weather to read, and were given pretests and posttests. Treatments were as follows: (1) strategy training--tactics for identifying the topic and main idea of paragraphs, as well as metacognitive strategies for checking main idea hypotheses; (2) classification training--instruction and practice in classifying words, phrases, and sentences under appropriate topics; (3) a combination of classification and strategy training; and (4) practice only (control group). All instruction was carried out via the computer. The results indicated significant effects of strategy training on the students' ability to identify the main idea in paragraphs about the training content and in paragraphs about new content. Classification training showed positive effects on paragraphs about the training content, but the effect did not transfer to new content. Results suggest that comprehension strategies and metacognitive strategies can effectively improve remedial readers' abilities to identify the main idea of expository paragraphs. (NKA)

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Report No. 4

November, 1986

THE EFFECTS OF STRATEGY TRAINING ON THE IDENTIFICATION OF THE MAIN IDEA OF EXPOSITORY PASSAGES

Robert J. Stevens

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The Center

The mission of the Center for Research on Elementary and Middle Schools is to produce useful knowledge about how elementary and middle schools can foster growth in students' learning and development, to develop and evaluate practical methods for improving the effectiveness of elementary and middle schools based on existing and new research findings, and to develop and evaluate specific strategies to help schools implement effective research-based school and classroom practices.

The center conducts its research in three program areas: (1) Elementary Schools, (2) Middle Schools, and (3) School Improvement.

The Elementary School Program

This program works from a strong existing research base to develop, evaluate, and disseminate effective elementary school and classroom practices; synthesizes current knowledge; and analyzes survey and descriptive data to expand the knowledge base in effective elementary education.

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School Improvement Program

This program focuses on improving the organizational performance of schools in adopting and adapting innovations and developing school capacity for change.

This report, prepared by the Elementary School Program, describes an experimental evaluation of the effectiveness of four methods for teaching remedial reading students how to identify the main idea of an expository paragraph.

Abstract

This study tested the relative effectiveness of four methods for teaching remedial reading students how to identify the main idea of expository paragraphs. Strategy training taught students strategies for identifying the topic and main idea of paragraphs, and metacognitive strategies for checking their main idea hypotheses. Classification training provided students with instruction and practice classifying words, phrases, and sentences under appropriate topics. These treatments were compared to a condition which combined both classification and strategy training, and to a practice-only control. The results indicated significant effects of strategy training on students' ability to identify the main idea in paragraphs about the training content and in paragraphs about new content. Classification training showed positive effects on paragraphs about the training content, but the effect did not transfer to new content. These results suggest that comprehension strategies and metacognitive strategies can effectively improve remedial readers' abilities to identify the main idea of expository paragraphs.

Introduction

The ability to comprehend textual information is a critical skill for success in academic settings. Students spend much of their time in school studying and learning information that is presented in text. Learning from text requires that they extract the main idea of what they have read and retain that and related information for future use. Text processing theories emphasize recognition and retention of the main idea of passages as significant processes in passage comprehension (Rumelhart, 1977; Thorndyke, 1977; van Dijk & Kintsch, 1978).

Lack of proficiency at recognizing the main idea or theme of passages decreases students' ability to comprehend passages and to recall information presented in passages, which in turn hinders them in many of their learning activities in school.

Many studies have examined the relationship between identifying main ideas in text and the amount and organization of information that is recalled. Cognitive studies by Brown and her associates (Brown & Campione, 1977; Brown, Smiley, & Lawton, 1978; Smiley, Oakely, Worthen, Campione, & Brown, 1977) and by Thorndyke (1977) found differential ability of good and poor readers to recall thematic propositions -- more proficient readers recalled more information from passages they read and, for those readers, the

probability of recall was related to the proposition's level of thematic importance. On the other hand, less skilled readers recalled much less information from passages, and their recall of propositions was not systematically related to the theme or main idea of the passage (Brown & Smiley, 1977).

Similarly, when students are taught studying strategies to help them organize and recall information from text, they must be able to recognize the main ideas before they can take advantage of the organizational strategies (Anderson, 1981). When less skilled readers are taught note-taking or studying strategies, they tend to use them ineffectively. They do not take notes on ideas related to the main idea of the passage, but instead take notes or underline more randomly than do good readers (Brown & Smiley, 1978).

Poor readers also lack metacognitive skills to realize that a comprehension problem exists and lack specific comprehension strategies to resolve the problem. Metacognitive skills involve knowledge about, and regulation of, the reading comprehension processes. In particular, regulatory processes such as strategies for monitoring and checking comprehension are noticeably absent in poor readers (Baker & Brown, 1984; Brown, Armbruster, & Baker, 1984; Bruce & Rubin, 1981; Collins & Smith, 1980; Kavale & Schreiner, 1979; Markman, 1977; Myers & Paris, 1978; Olshavsky, 1976-77; Pace, 1981; Ryan, 1982). Poor readers are also unable to take specific steps to resolve comprehension problems when they are given feedback that problems exist. "They (poor readers) display limited use of task-specific strategies and metacognitive control of those activi-

ties" (Brown & Palincsar, 1982).

Comprehension strategies instruction. Recent research has focused on deliberate attempts to teach students comprehension and metacomprehension strategies to improve their reading ability. Brown and Palincsar (1982) have suggested a three-phase "ideal training strategy" that includes instruction in comprehension fostering strategies, instruction on the importance and usefulness of the strategies, and metacognitive monitoring strategies to check the appropriateness of strategy use.

This type of strategic instruction has been applied successfully in a number of studies on a variety of comprehension skills (Brown & Palincsar, 1982; Day, 1980; Franks, Vye, Auble, Mezynski, Perfetto, Bransford, Stein & Littlefield, 1982; Hansen, 1981; Hansen & Pearson, 1982; Paris, Cross & Lipson, 1984; Raphael, 1980).

Day (1980), for example, developed five strategies for writing summaries of passages and also developed self-management strategies to check the appropriateness and accuracy of the summaries. The students who received training that integrated the writing and self-management strategies produced more accurate summaries than did students who were trained in either self-management or summarization strategies alone. This seems to indicate the importance of the metacognitive component in strategic instruction. More effective training includes teaching students self-regulation skills that enhance their ability to monitor their own cognitive activities (Brown, Campione, & Day, 1981). As Bransford has suggested, merely teaching students comprehension strategies may not be sufficient:

"...they may also be lacking in sensitive criteria for assessing their comprehension. Helping them learn to learn, therefore, involves changing their approach to comprehension tasks" (Bransford, 1979, p. 199).

Paris and his associates have investigated the impact of "informed training" on the importance and usefulness of strategies in reading. In the "informed training" condition, students were given instruction in cognitive and metacognitive strategies and an explanation of the rationale behind the strategies and their usefulness. Such training is important because it "informs learners about the value and situational appropriateness of various strategies" (Paris, Cross & Lipson, 1984, p. 1241). The "informed training" intervention was compared to uninformed training on the same strategies. Paris, Newman & McVey (1982) found informed-training students performed better than did students in the uninformed condition on reading comprehension measures during training and on subsequent retention probes after training. Because retention and future use is important for educational significance, developing students' awareness of the importance of strategic training seems to be a critical feature of an effective strategic instruction intervention.

Concept level instruction. An alternative approach to improve students' ability to recognize thematic information in paragraphs involves instruction and practice in classifying words (concepts). This viewpoint suggests that relations between concepts used in word level comprehension activities are analagous to the types of

relations involved in comprehending propositions in extended discourse (Guszak, 1972; Pearson & Johnson, 1978). Instruction and practice on superordinate and subordinate relations of words is seen as a related, lower level skill to identifying the main idea -- the superordinate proposition -- of a paragraph.

The organizational processes involved in understanding the topic and main idea of paragraphs in a passage, and in understanding sentences or propositions within a paragraph, are similar to those used to categorize or classify words or concepts. Comprehending the main idea and supporting details of a passage involves understanding the superordinate and subordinate relations of the propositions in the passage. "In this regard, finding the main idea, or topic, or topic sentence is similar to finding a category label for a list of words" (Pearson & Johnson, 1978, p. 90). Category labels, topics, and main ideas all act as thematic cues the reader uses to select schemata to use in organizing and comprehending the information presented. Main idea instruction is "intrinsically related to other comprehension activities, such as categorizing" (Pearson & Johnson, 1978, p. 94). Instruction and practice on recognizing and using these thematic cues to organize information in simple, word level activities may transfer to similar types of information organization tasks, such as recognizing the main idea and related details in a paragraph.

Classification activities are prevalent in classroom instruction in reading, particularly at earlier levels. Most basal reading curricula use classification or categorization activities for

vocabulary or comprehension instruction (Armbruster, Stevens, & Rosenshine, 1977). Categorization activities have been called "among the most helpful a teacher can assign" (Pearson & Johnson, 1978, p. 62). Students might be asked to classify words or concepts under the appropriate superordinate category, or they might be given a list of words and asked to give the class a superordinate name. For example:

superordinate - thunderstorm

subordinate - heavy rain, lightning, thunder, dark clouds

Despite the prevalence of concept classification activities in classrooms, their relationship to reading comprehension is unclear. Understanding the superordinate and subordinate relations among concepts may directly transfer to comprehending the relations among propositions in a paragraph, or this understanding may increase students' background knowledge, which is used during comprehension in more subtle ways. Practice on activities like the example above may, in fact, improve the students' ability to identify the main idea of a paragraph about thunderstorms because they gain more background knowledge or have more accessible background knowledge about the content to use in comprehending the paragraph.

This study investigates the relative effectiveness of instructional methods for improving remedial reading students' ability to identify the main idea of expository paragraphs. The methods involve strategic instruction, word level classification instruction, combined strategic and classification instruction, and a practice-only control. For the purposes of this study, the main

idea of a passage was defined as a relatively brief (one sentence) summary of the information presented in the majority of the propositions in the passage, excluding trivial or redundant information.

Method

Subjects

The subjects were students in grades 6 through 11 who had been assigned to remedial reading classes in schools in a small midwestern city. Placement in these classes was based on the criterion of reading at least two years below grade level (as measured by a standardized achievement test). From the population of 102 students, 56 were selected who had a measureable skill deficiency in identifying the main idea of paragraphs, but who were competent at literal comprehension. These students were selected using an experimenter-designed criterion referenced test, which also functioned as a pretest for the experimental population. Prior to testing, the experimenter decided the criteria for selection would be (a) the student scored 70% or better on 10 literal comprehension (detail) questions and (b) 60% correct or less on 10 main idea questions. Thus the selected students were reading significantly below grade level and were measurably deficient in identifying the main idea of expository paragraphs. Due to extended absences and student transfers, complete data were available for 47 of the 56 students initially selected.

The students were given the Reading Comprehension and Vocabulary subtests of the Iowa Test of Basic Skills (Hieronymus, Lindquist, &

Hoover, 1982) as premeasures of their comprehension ability and general verbal ability. The subjects' mean grade equivalent for reading comprehension was 5.2 (s.d. = 1.5), and for vocabulary was 5.2 (s.d. = 1.6). There were no significant differences between the treatment groups in terms of their entering abilities as measured by these tests.

Materials

Passages. Expository passages were selected as the focus of this study because they are the type of passage most frequently encountered by students in grades 6 to 11 in content area reading. Students in all treatment groups were given the same pool of 125 paragraphs about topics in geology and weather. The students had little or no previous instruction in these content areas, and a brief assessment indicated little prior knowledge or interest in either topic for the students in all of the treatment groups.

The length, structure, and type of paragraphs were varied, as each of these characteristics can influence a student's ability to identify the main idea (Brown, 1981; Goetz & Armbruster, 1981; Kieras, 1978). During the intervention the paragraphs progressed from shorter, easier paragraphs to longer, more complex paragraphs, and ranged in length from 85 to 160 words. According to the Flesch readability formula, the difficulty of the paragraphs ranged from grade level 4.5 to 9.0.

A variety of expository paragraph types were written -- descriptive, comparitive, sequential, causal (Meyer, Brandt, and Bluth,

1980). Paragraphs varied in length, and were written with and without explicit topic sentences. Paragraphs with topic sentences were varied so that the topic sentence occurred at the beginning, middle, or end of the paragraph. Varying the length, structure, and type of paragraphs not only removed potential confounding due to these variables, but also improved the potential generalizability of these comprehension skills to the students' other reading experiences.

Pretests. A pretest was given as a measure of the students' entering ability and, as described previously, to determine which students were most appropriate for the experiment. The pretest was a 30-item test made up of 10 expository paragraphs about geology and weather. For each passage there was a detail question, a main idea question, and an inference question. The detail questions were textually explicit and the inference questions were scriptually implicit, as described by Pearson and Johnson (1978). The main idea questions simply asked the students to identify the main idea of the passage.

Posttests. Posttests were developed in the same manner as the pretest, each using 10 expository paragraphs. Each posttest had two questions for each passage, a main idea question and an inference question. Main idea questions were used to measure the effectiveness of the various treatments for teaching the students how to identify the main idea of paragraphs. The inference questions were used to determine if this training generalized to another comprehension skill.

Two separate posttests were designed. One used the same subject matter as the pretest and the training materials (geology and weather), and the other used different subject matter (American Indians, space exploration, and biology). This was done to investigate whether the training effect was content specific, or if the students could transfer the effects of the training to other content areas.

Reliability. The reliability of the experimenter-designed tests was estimated by using a group of 25 non-experimental students from the same remedial reading classes used in the study. The tests were administered during two class periods and the order of administration was counterbalanced. The internal consistency (alpha coefficient) of the subtests (10 items each) ranged from .61 to .63 for the inference subtests and from .65 to .79 for the main idea subtests. The intercorrelations between the three main idea subtests ranged from .61 to .72, and for the three inference subtests from .51 to .83. Both the levels of internal consistency and the alternate forms reliabilities are well within the acceptable range for experimental research (Gronlund, 1977; Nunnally, 1978).

Procedure

After taking the pretest, the students were randomly assigned by computer to one of four treatment groups in a 2 x 2 factorial design. The factors were Strategy Training (present or absent) and Classification Skill Training (present or absent). The combination of these factors produced four cells: Strategy Training, Classification Skills Training, Combined treatment, and Control (described

below). Each group received the instructional treatment via PLATO, a computer-assisted instruction (CAI) delivery system. The PLATO terminals were located in a corner of the remedial reading teacher's classroom. In all treatments the teacher and experimenter acted only to facilitate the CAI instruction (e.g., solve any system-related technical problems, manage the classroom). The instruction and practice for all of the treatment groups was provided solely via the computer. The students took the posttests on the first school day after they completed their treatment. The experimental and non-experimental content posttests were administered in a counterbalanced fashion within treatment groups.

All students in the study had previous computer experience as participants in a computerized remedial instruction project, part of the PLATO Education Program at the University of Illinois. Using a CAI system to deliver the interventions removed any variation in the treatments that would be due to different presentations of the material by different teachers. Thus, each student's instruction varied by the student's treatment condition, and not by teacher instruction.

Treatments

Strategy training. This treatment provided students with explicit instruction in comprehension fostering strategies and metacomprehension strategies, and an explanation of their usefulness in understanding and remembering the information presented in the passage. Students in this group were taught specific strategies for identifying the topic and main idea of paragraphs. The strategy

instruction stressed that the main idea of the passage should be a short summary of what all of the sentences in the passage tell about the topic. Students also were taught a self-checking strategy to judge the appropriateness of their main idea statement by testing its completeness and accuracy in summarizing the information in the passage.

The students were taught to identify the topic of the passage by identifying what subjects (concepts) each of the individual sentences discussed. Initially, the students learned a text-based procedure in which they were directed to the information in the text to determine which subject(s) the sentence was about. The students received instruction via computer tutorial which modeled the text-based procedure for each sentence of the paragraph, noting the subject of each of the sentences. The sentence-by-sentence analysis enabled the students to identify the topic as the subject which was most frequently referred to in the passage. The computer tutorial also taught that there may be various referents for a particular subject. For example, a passage about the Rocky Mountains might refer to them as "the Rockies," "the mountains," "they," or "giant snow-covered peaks of granite."

Following the tutorial, the students practiced this strategy in a multiple choice format. Initial stages of practice used heavily prompted items that were very similar to the tutorial. Later practice activities were less prompted, simply asking the student to read the paragraph and identify the topic from a list of alternatives. Any errors made by the student were corrected by directing

the student's attention to relevant portions of the text and indicating that the word or phrase was another name or way of referring to the topic. Items that were answered incorrectly were then coded as "not mastered" by the computer and returned to the practice queue. Then the student was given another similar paragraph and a repeat of the activity.

After instruction and practice on identifying the topic of paragraphs, students were taught strategies for identifying the main idea of the passage and metacomprehension strategies for self-checking. The students learned that the main idea of a paragraph summarizes what the paragraph tells about the topic. The summary should be one sentence that covers all the main points told about the topic, without being so general that the main idea could fit a different paragraph on the same topic.

Initially these strategies were modeled via computer tutorial, which presented a portion of the paragraph and then described what potential main idea(s) fit the paragraph to that point. This was followed by practice with corrective feedback in which portions of paragraphs were presented to the student in an activity like the tutorial. Students selected potential main ideas from a list of choices, and were given feedback on the "goodness of fit" of the choice to the paragraph. The distractors in the multiple choice format focused on the discriminations modeled in the tutorial, and included: 1) statements about the topic that summarized only a portion of the passage, 2) statements about the topic that summarized a detail from the passage, 3) statements about the topic that

were very general and not specific to what the particular passage told about the topic, and 4) statements about the topic that were unrelated to the passage. For each case, feedback on incorrect responses focused on the appropriate discrimination and the inappropriateness of the alternative selected.

The computer tutorial also modeled metacognitive strategies for checking main idea statements by comparing them to the textual information provided. Students were presented with a portion of a passage (two to three sentences) and asked if they could select the appropriate main idea from a list of four alternatives. If not, they could get another portion of the paragraphs. In most cases at least three of the four alternatives were plausible main ideas for the first portion of the passage. The instruction described the need to have more information to make an accurate choice, thus reemphasizing that a good main idea statement summarizes the entire passage. As more of the passage was presented, the instructional program provided the student with a model of how the added information helped to narrow the plausible choice until the entire passage was present and only one of the main idea choices was appropriate. During this instruction the students were taught that potential main idea choices could be confirmed or refuted based upon information in the text and its interaction with their prior knowledge.

Following the tutorial, the students practiced determining if portions of a paragraph provided sufficient information to select an appropriate main idea. From a stepwise process of providing more information about the paragraph, students learned that additional

information made it easier to identify the main idea. Students also learned to check their earlier choice(s) against the additional information. This self-checking strategy provided students with a way to evaluate their knowledge about the passage and the appropriateness of their use of the comprehension fostering strategies for identifying the main idea.

Classification skills instruction. This treatment provided students with word level comprehension activities as an introduction to passage level comprehension activities. The students were provided with instruction and practice on classifying words under topics and using class labels (category labels) for a list of words. To facilitate the potential transfer of these categorization skills to identifying the main idea of paragraphs, the content of many of the instructional tasks was similar to the content of the instuctional paragraphs (related to concepts in weather and geology). For example, given a list of words, students might classify 'lightning,' 'thunder,' 'heavy rain,' and 'dark clouds' under the topic 'thunderstorm.' Incorrect responses received immediate feedback on why the response was wrong. Upon completion of the item, it was coded "not mastered" by the computer and returned to the practice queue, and the student was given another item of the same type.

The treatment also involved classification activities using phrases and sentences to further strengthen the bridge between word level and passage level comprehension. Students were asked to sort subordinate items into the correct categories given three possible categories, or they were asked to give an appropriate category label

to a list of subordinate items. For example:

Category: A thunderstorm was coming.

Subordinate Items: The sky turned gray with large dark clouds.
Thunder rumbled through the air.
The wind started blowing harder.
Lightning streaked through the sky.

The purpose of the word, phrase, and sentence classification tasks was to help the students learn superordinate and subordinate relations in text forms that were simpler than paragraphs, but which had similar informational relationships. It was hoped that gradually making the text more complex would help the students transfer organizational skills from words to ideas in paragraphs.

Finally, the students were given instruction and practice identifying the topic and main idea of expository paragraphs. The instruction for these activities was similar to that used in traditional basal instruction (Armbruster, Stevens, & Rosenshine, 1977); the students were told that a good main idea (or topic) is one that sums up the whole passage, just as a good class label tells what all of the things in a class are like. The practice activities asked students to select the appropriate topic or main idea from a list of four alternatives. Incorrect responses were given immediate, corrective feedback, either that the choice did not sum up the whole passage, or that it was too general to tell what the passage was about. Then the paragraph was returned to the practice queue and the student received an additional practice item of that type.

Combined treatment. The combined treatment group received both the Strategy Training and Classification Skills Training. In this group, the students received instruction and practice on classification skills, strategies for identifying the topic and the main idea, and metacomprehension strategies.

Control treatment. The control treatment involved practice only, on topic and main idea questions about expository paragraphs. In observing reading instruction, Guszak (1967) noted that students typically were asked detail questions about what they had read, and suggested that this preponderance of practice on detail questions resulted in students' lower performance on other types of questions, such as inference questions. Guszak proposed that increasing the quantity of student practice on other types of comprehension questions could improve student performance on those types of questions. Therefore, it was felt that a practice-only treatment would offer a strong control with which to compare the treatments.

Students in the control condition read paragraphs from the same pool used in the other treatments. Each paragraph was presented with a multiple choice question about the topic or main idea of the paragraph. The questions and distractors were identical to those used in the other treatment conditions. When students answered the question correctly, they received positive feedback and proceded to the next item in the sequence. When students answered incorrectly, they received negative feedback like that in the other treatments. The item was then returned to the practice queue and another similar item given.

Results

The outcome measures were analyzed using a 2 x 2 analysis of covariance. Because the CAI lessons were self-paced, the different instructional features in the treatment conditions produced significant differences between the groups in the amount of time spent in instruction (see Table 1). To control for these differences, time was used as a covariate in the analyses. Students' scores on initial reading achievement were also used as a covariate to increase the statistical power of the analyses, although there were no significant differences on their initial reading achievement.

Insert Table 1 about here

Tables 2 and 3 present the treatment group means for our analyses. Table 2 shows that for main idea questions on paragraphs about the training content, the results of the analysis of covariance indicated significant treatment effects for both Strategy Training, $F(1,41) = 23.16$, $p<.001$, and for Classification Skill Training, $F(1,41) = 8.20$, $p<.01$. However, Table 3 shows that for main idea questions on the generalization paragraphs, only the Strategy Training treatment had a significant effect, $F(1,41) = 7.74$, $p<.01$. The group means also indicate that students who received Strategy Training answered more main idea questions about paragraphs correctly, regardless of whether the content was the same as or different from that used in the treatment.

Insert Table 2 and Table 3 about here

Inference questions about training content paragraphs and generalization paragraphs were used as a measure of transfer of the treatment effects to skills not explicitly a part of the training. The results of the analysis for the training content paragraphs indicated a significant interaction effect ($F = 5.34$, $p<.05$, see Table 4). Inspection of the cell means in Table 4 shows that the students who received both Strategy Training and the Classification Skills Training had a higher posttest mean score than those of the other three treatments. However, a post-hoc comparison of the adjusted cell for the combined group versus the control group indicated no significant difference. For inference questions about generalization paragraphs, there were no significant treatment or interaction effects.

Insert Table 4 about here

Discussion

The results of this study support the hypothesis that training remedial reading students in strategies for identifying the main idea of paragraphs and related metacognitive strategies improves their ability to identify the main idea of expository paragraphs. There were significant main effects for the Strategy Training treatment for paragraphs about both the training content (geology and weather) and for generalization paragraphs about new content (biology, space exploration, and American Indians).

The potential instructional utility of strategy training is evidenced by the fact that students were able to transfer these

skills to paragraphs about content which was different from that used in the training paragraphs. This transfer effect suggests that these strategies and metacognitive skills are precise enough to improve students' specific comprehension skills, yet are sufficiently general to avoid being content-specific.

The effect size (adapted from Glass, McGaw & Smith, 1981) of the Strategy Training treatment further underscores the usefulness of this instructional intervention. On the main idea posttests, the effect size (adjusted mean treatment - adjusted mean control)/control standard deviation) for the training content paragraphs was .77, and for the generalization paragraphs was .80. The magnitude of these effect sizes suggests that the strategy training was not only significant, but also produced a meaningfully large effect on the students' performance.

The logic of the Classification Skills Training suggested that instruction and practice in classifying words, phrases, and sentences under appropriate topics would improve the students' ability to identify the main idea of paragraphs. The thought was that both skills (classification and main idea identification) involved more general cognitive organization skills, and that instruction and practice on one would result in improvement on the other. However, the results indicate limited effectiveness and hence only conditional support for this treatment. Classification training improved students' ability to identify the main idea only for paragraphs written about the same content as that which was used in the training. When the paragraphs were about new content, Classifica-

tion Skills Training did not have any impact on the students' ability to identify the main idea of the passage.

These content-specific results for the Classification treatment suggest that these activities did not directly affect students' ability to identify the main idea of paragraphs. Rather, they affected the students' background knowledge, which in turn affected their comprehension of the training content paragraphs.

Most of the classification exercises used content-specific terms from weather and geology, which related directly to the paragraphs (about weather and geology) for which they were to identify the main idea. The students who received the Classification Skills training did improve in their ability to identify the main idea of experimental paragraphs about weather and geology. However, the students did not seem to learn the more general cognitive organization skills, as indicated by the lack of transfer to new content paragraphs. Instead, the classification activities either activated students' background knowledge or provided them with content specific knowledge they did not have previously. The students were able to use this background knowledge to help them identify the main idea of paragraphs about geology and weather, but it was not useful for comprehending the main idea of the generalization paragraphs about new content. Thus, for remedial readers, classification exercises may be valuable for teaching or activating background knowledge about specific content, but these skills may not be the most effective way to teach them how to identify the main idea of an expository passage.

The results of the inference posttests indicate little or no transfer of either Strategy Training or Classification Skill Training to students' ability to answer inference questions about paragraphs they've read. The results suggest that the treaments improved the students' ability to identify main ideas, but did not affect a more general reading comprehension ability.

There was a significant interaction effect on inference questions on paragraphs about the training content. Students who received both the Strategy and the Classfication Skills treatments performed better on answering inference questions, but the adjusted mean scores for this group were not significantly higher than those for the control group. The lack of significance for the contrast of these means prevents any conclusions being made about this interaction.

The design of the study limits the generalizability of these results in three ways. First, this study is restricted to expository paragraphs, which may constitute a major portion of students' reading experiences, but which have different text structures from other passage types, such as narratives (Meyer, Brandt, & Bluth, 1980). Therefore, further research is required to test the applicability of these strategies with other types of paragraphs.

Second, these instructional interventions were implemented via computer-assisted instruction. This type of delivery system permitted highly individualized instruction by providing students with immediate feedback, additional practice, and reteaching when necessary. Although this may be attempted by classroom teachers, it

would be difficult for them to replicate the flexibility of the computer. Also, some of the exercises would have to be modified to workbook exercises or group demonstration and practice lessons in order to be used in teacher instructed classrooms.

Third, the subjects used in this study were remedial reading students, which limits the degree to which the results can be generalized to initial instruction in reading comprehension. Potentially their previous experience and failure in reading made these students better prepared to learn or to use specific comprehension strategies. Their previous failure may have made them somewhat more aware of their need for specific types of strategies, and their success with these instructional strategies would then be very reinforcing. Similarly, the previous experience of the students may have had an impact on the effectiveness of the classification training. Further research with elementary level students, particularly in the initial stages of comprehension instruction, may help to clarify some of these issues.

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Table 1

Descriptive Data on Time and Passages Read

Mean and Standard Deviation

		Classification Training	No Classification Training
Time in Instruction			
Strategy Training	M	267.1	193.4
	SD	77.3	29.6
No Strategy Training	M	195.4	127.4
	SD	49.1	54.2
Number of Passages Read			
Strategy Training	M	105.6	104.8
	SD	14.9	15.8
No Strategy Training	M	102.5	107.2
	SD	1.7	2.7

Note. Instructional time is in minutes.

Table 2

Adjusted Group Means and Analysis of Covariance for the Main Idea Posttests on the Training Content Passages

		Classification Training	n	No Classification Training	n
Strategy Training	M	7.27	11	6.50	12
	SD	1.44		1.08	
	ADJ. M	6.81		6.58	
No Strategy Training	M	5.77	13	4.45	11
	SD	1.89		1.62	
	ADJ. M	5.64		4.97	

Analysis of Covariance

Source of Variance	df	Mean Square	F
Covariates:			
Time	1	6.42	3.88 *
Reading Achievement	1	38.58	23.29 ***
Main Effects:			
Strategy Training	1	38.37	23.16 ***
Classification Training	1	13.59	8.20 **
Interaction	1	.48	.29
Residual	41	1.66	

Table 3

Adjusted Group Means and Analysis of Covariance for the Main Idea Posttests on the Generalization Passages

		Classification Training	n	No Classification Training	n
Strategy Training	M	6.73	11	6.92	12
	SD	1.31		1.54	
	ADJ. M	6.27		6.99	
No Strategy Training	M	5.08	13	4.73	11
	SD	2.27		1.56	
	ADJ. M	4.95		5.24	

Analysis of Covariance

Source of Variance	df	Mean Square	F
Covariates:			
Time	1	17.58	8.09 **
Reading Achievement	1	43.16	19.86 **
Main Effects:			
Strategy Training	1	16.83	7.74 **
Classification Training	1	2.53	1.16
Interaction	1	.55	.25
Residual	41	2.17	

Table 4

Adjusted Group Means and Analysis of Covariance for the Inference Posttest on the Training Content Passages

		Classification Training	n	No Classification Training	n
Strategy Training	M	6.27	11	5.00	12
	SD	1.48		2.09	
	ADJ. M	5.81		5.08	
No Strategy Training	M	4.62	13	5.09	11
	SD	1.13		1.04	
	ADJ. M	4.49		5.60	

Analysis of Covariance

Source of Variance	df	Mean Square	F
Covariates:			
Time	1	1.11	.60
Reading Achievement	1	18.62	10.01 **
Main Effects:			
Strategy Training	1	6.90	3.71
Classification Training	1	1.25	.65
Interaction	1	9.94	5.34 *
Residual	41	1.86	